US-PAT-NO: 5092953

DOCUMENT-IDENTIFIER: US 5092953 A

TITLE: Aqueous vinyl chloride-ethylene copolymer/polyisocyanate adhesive compositions for wood composites

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Abstract Text - ABTX (1):

A **water-based adhesive** composition comprising a polyvinyl alcohol stabilized vinyl chloride-ethylene copolymer latex and 5-50 wt %, based on copolymer, of a polyisocyanate material. The adhesive composition has improved pot life and is used to prepare wood composites demonstrating improved water resistance.

Brief Summary Text - BSTX (2):

This invention relates to **water-based adhesive** compositions containing an isocyanate compound and, more particularly, relates to vinyl chloride-ethylene copolymer/polyisocyanate adhesive compositions.

Brief Summary Text - BSTX (4):

There is a need for **water-based adhesive** compositions to provide high strength, bonded wood composites that would be suitable for use in exterior applications, particularly when laminated at room temperature. Another hindrance to the use of water-based systems is that most polymer/isocyanate adhesive compositions have very limited pot lives of less than about 30 minutes. In the past, self-crosslinking vinyl and acrylic polymers and the combinations of these polymers with polyisocyanates have been used in making wood composites, but these either fell short of the required bond characteristics or were difficult to employ because of the relatively short pot life or toxicity shortcomings.

Brief Summary Text - BSTX (13):

U.S. Pat. No. 4,396,738 discloses **aqueous adhesive** and coating compositions comprising:

Brief Summary Text - BSTX (18):

U S. Pat. No. 4,491,646 discloses an **aqueous latex adhesive composition of the type having an aqueous** latex admixture with an organic solvent-dispersed multi-isocyanate cross-linking agent and a thickener. The improvement for a room temperature curable **adhesive composition having improved water**-resistance comprises the curable ingredients consisting essentially of an aqueous hydroxyl functional acrylic latex which contains hydroxyl groups as the only isocyanate reactive functionality and the multi-isocyanate cross-linking agent.

Brief Summary Text - BSTX (19):

U.S. Pat. No. 4,609,690 discloses an **aqueous latex adhesive composition which is an aqueous** latex admixture with a water dispersible multi-isocyanate cross-linking agent and a thickener. The improvement for a room temperature curable **adhesive composition having improved water**-resistance comprises the curable ingredients consisting essentially of an aqueous hydroxyl functional latex which contains hydroxyl groups as its only isocyanate reactive functionality and the multi-isocyanate cross-linking agent. The cross-linking agent is a water dispersible or water dispersed multi-isocyanate and preferably is a multi-isocyanate which has undergone partial reaction of some of its isocyanate groups with a hydrophobic monohydroxy alcohol.

Brief Summary Text - BSTX (25):

J57/85,871 discloses an adhesive **composition comprising an emulsion of ethylene/vinyl acetate copolymer containing polyvinyl alcohol** and an adduct of di-isocyanate prepolymer with a polyhydric alcohol.

Brief Summary Text - BSTX (27):

The present invention provides a **water-based adhesive** composition especially for wood composite applications which demonstrates good pot life and superior bond strength and water resistance. The **aqueous adhesive** composition consists essentially of:

Brief Summary Text - BSTX (30):

In a preferred embodiment, non-water dispersible polyisocyanates are suprisingly suitable for combining with the polyvinyl alcohol stabilized vinyl chloride-ethylene copolymer latex to make the **water-based adhesive** composition.

Brief Summary Text - BSTX (31):

Another embodiment of the invention provides a method for joining or laminating one substrate (preferably wood) to another substrate, especially to make a wood composite, which comprises applying a coating of the **water-based adhesive** composition to a surface of the substrate, partially drying the adhesive coating and joining the adhesive-coated surface with a surface of the other substrate. A further embodiment is a laminate comprising the two substrates bonded together with the adhesive composition. The invention provides high performance, exterior grade wood assemblies such as, for example, fire door assemblies, wood mouldings, laminated lumber, and reconstituted wood boards.

Brief Summary Text - BSTX (32):

The **aqueous adhesive** compositions of the invention also obviate the environmental and health concerns associated with solvent-containing adhesives.

Brief Summary Text - BSTX (40):

The **water-based adhesive composition comprises an aqueous medium containing an adhesive** component which comprises a vinyl chloride-ethylene emulsion copolymer and a polyisocyanate.

Brief Summary Text - BSTX (41):

Perhaps the most important ingredient of the **water-based adhesive** composition according to the present invention is the vinyl chloride-ethylene emulsion copolymer. The **adhesive composition comprises an aqueous** polyvinyl alcohol stabilized vinyl chloride-ethylene copolymer latex, which is 20-70 wt % solids, preferably 40-60 wt % solids, the copolymer containing 5-50 wt %, preferably 1O-30 wt %, based on copolymer, of a solvent-free, water-dispersible polyisocyanate material. The viscosity of the adhesive composition should be within the range of 200-5000 cps. A copolymer prepared from a monomer mixture that is 65-90 wt % vinyl chloride, 5-35 wt % ethylene and 0-10 wt % hydroxyalkyl (meth)acrylate in the presence of a polyvinyl alcohol stabilizing system would suitably have a Tg from about 0-40.degree. C., preferably 5-30.degree. C.

Brief Summary Text - BSTX (59):

In addition to the polyvinyl alcohol/vinyl chloride-ethylene copolymer latex, the **aqueous adhesive** composition also contains per 100 parts by weight copolymer about 5-50 parts, preferably 10-30 parts, polyisocyanate.

Brief Summary Text - BSTX (63):

The **aqueous adhesive** compositions for industrial applications may also contain other components well known in the art in typically used amounts such as plasticizer, defoaming agent, thickening agent, coalescing agent and filler. The use of surfactants, hydroxyl or carboxyl containing additives and acidic or basic fillers is not recommended. Associative thickeners are preferred.

Brief Summary Text - BSTX (64):

The components are simply mixed in the specified amounts to yield a **water-based adhesive** composition that will firmly bond such materials as plastics like vinyl chloride, polyester, metallized polyester and polystyrene, cellulosic substrates like wood, plywood and composite board, paper, and metal to themselves and to each other, especially composites comprising wood to wood substrates. Since the polyvinyl alcohol/vinyl chloride-ethylene copolymer will be an aqueous latex, the polyisocyanate material is merely added with gentle agitation and diluted with water, as necessary, to obtain an appropriate viscosity for application.

Claims Text - CLTX (1):

1. In a method for making a wood-wood laminate by applying an **aqueous polymer/isocyanate adhesive** composition to a surface of the first wood substrate and joining the adhesive-coated surface with a surface of the second wood substrate, the improvement which comprises applying a **water-based adhesive** composition consisting essentially of:

Claims Text - CLTX (7):

5. In a method for making a wood-wood laminate by applying an **aqueous polymer/isocyanate adhesive** composition to a surface of the first wood substrate and joining the adhesive-coated surface with a surface of the second wood substrate, the improvement which comprises applying an adhesive composition consisting essentially of aqueous copolymer latex and a polyisocyanate having an isocyanate functionality greater than two, the aqueous latex containing 20-70% solids of a copolymer prepared by the emulsion polymerization of a monomer mixture that provides a copolymer consisting essentially of 65-90 wt % vinyl chloride, 5-35 wt % ethylene, and 0-10 wt % C.sub.2 -C.sub.4 hydroxyalkyl (meth)acrylate in the presence of a stabilizing system consisting essentially of 3-15 wt % (based on monomers) polyvinyl alcohol which is 70-91 mole % hydrolyzed.

Claims Text - CLTX (11):

9. In a method for joining a wood substrate to a second wood substrate which comprises applying a coating of an **aqueous polymer/polyisocyanate adhesive** composition to a surface of the first wood substrate, partially drying the adhesive coating and joining the adhesive-coated surface with a surface of the second wood substrate, the improvement which comprises applying an adhesive composition consisting essentially of an aqueous copolymer latex and 10-30 wt % (based on copolymer) polyisocyanate having an isocyanate functionally greater than two, the aqueous latex containing 40-60% solids of a copolymer prepared by the emulsion polymerization of a monomer mixture that provides a copolymer consisting essentially of 65-90 wt % vinyl chloride, 5-35 wt % ethylene, and 0-10 wt % C.sub.2 -C.sub.4 hydroxylalkyl (meth)acrylate in the presence of a stabilizing system consisting essentially of 4-10 wt % (based on monomers) polyvinyl alcohol which is 87-89 mole % hydrolyzed.